sented in Figs. 1, 2, 3, 4, and 5,) I have deemed an explanation of the same in detail to be unnecessary.

The several parts of the foregoing apparatus may be made of such materials as it may be deemed advisable by the constructor to employ in reference to the efficiency of the machine, economy in its cost, or other considerations that may influence him, and the form and arrangement of the several parts may be varied indefinitely without essentially changing the character of the invention.

It will have been seen that a great object aimed at in the construction of the machine is as perfect a system of compensations (chemical and mechanical) as possible. Thus the heat evolved and carried off in the condensation of air is replaced in the expanding-engine by an abstraction of heat from the water to be frozen through the intervention of the liquid in the cistern. In the consumption and production of mechanical force these compensating equivalents are more general and more marked. It has already been intimated that the power consumed in compressing air is nearly all recovered in the force exerted by its subsequent dilatation, and it has been shown in what way the force required to inject the water for receiving the heat of the condensed air may be, in a great measure, derived from the pressure of the air in the reservoir. It is evident that a mechanical apparatus admitting of such a system of compensations must operate, in theory at least, without the consumption of any power other than that required to overcome its friction, and to supply the loss arising from the difference of temperature, and consequently of bulk, between the air as it exists before condensation and after expansion; and, practically, the working of the machine is found not to differ materially from this result, and thus it presents by far the most comprehensive application of natural laws to the economical production of cold that it is believed has ever been devised.

Having thus fully made known my improved process of manufacturing ice and explained and exemplified suitable machinery for carrying the same practically into operation, I wish it to be understood that I do not claim as my invention any of the several parts of the apparatus in themselves; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. The employment of a liquid uncongealable at the low temperature at which it is required to keep the engine, to receive the heat of the water to be congealed and give it out to the expanding air.

2. The employment of an engine for the purpose of rendering the expansion of the condensed air gradual, in order to obtain its full refrigeratory effects, and at the same time render available the mechanical force with which it tends to dilate, to aid in working the condensing-pump irrespective of the manner in which the several parts are made, arranged, and operated.

3. Supplying the water gradually and slowly to the freezing-vessels and congealing it by abstracting the heat from its under surface, substantially as herein set forth.

4. The process of cooling or freezing liquids by compressing air into a reservoir, abstracting the heat evolved in the compression by means of a jet of water, allowing the compressed air to expand in an engine surrounded by a cistern of an unfreezable liquid, which is continually injected into the engine and returned to the cistern, and which serves as a medium to absorb the heat from the liquid to be cooled or frozen and give it out to the expanding air.

JOHN GORRIE.

Witnesses:
JOHN G. RUAN,
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